SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 21.—"The Innervation of the Pulmonary Vessels." By J. Rose Bradford, M.B., D.Sc., George Henry Lewes Student, and H. Percy Dean, M.B., B.S., B.Sc. Communicated by E. A. Schäfer, F.R.S. (From the Physiological Laboratory of University College, London.)

Hitherto no direct experimental proof of the existence of vasomotor fibres for the vessels of the mammalian lung has been obtained. The method used by us consisted in exciting the roots of the upper dorsal nerves, and recording simultaneously the effects produced on the aortic and pulmonary blood-pressure. The aortic pressure was measured in the usual way, *i.e.* a mercurial manometer was connected with the carotid artery. A second manometer was then connected with the branch of the pulmonary artery distributed to the lower lobe of the left lung. All the observations were made on dogs.

Before considering the results obtained by excitation of the upper dorsal nerves, it is necessary to know what effect a given rise of aortic pressure will have on the pulmonary pressure. This was determined by the three following methods:—

I. Excitation of the peripheral end of a divided splanchnic.

II. Excitation of the lower end of the spinal cord divided in the middle of the dorsal region.

III. Compression of the thoracic aorta.

By all these methods an enormous rise in the systemic blood-pressure is obtained, but the simultaneous pulmonary rise is very small. Thus the aortic pressure may be doubled or even quadrupled. The rise of the pulmonary pressure is always small and sometimes absent. The rise, as a rule, is about one-fifth of the total pulmonary pressure, *i.e.* the rise is then very small compared with the doubling or quadrupling of the systemic pressure. The relative ratio of the pulmonary rise to the carotid rise is that the former is about one-twentieth of the latter. Hence an enormous increase of systemic pressure is required in order to cause even a small rise of pressure in the pulmonary vessels.

The same occurs when the aorta is compressed, no rise of pulmonary pressure occurs unless the aortic rise is not only very marked but also of some duration, *e.g.* 30 seconds.

Excitation of the central end of the sciatic causes but a very slight pulmonary rise. The central end of the vagus gives larger effects, due to reflex contraction of the pulmonary arterioles, and the central end of a posterior root of one of the upper dorsal nerves gives still greater effects.

If the vasomotor centre in the medulla be excited, a great rise of both pulmonary and systemic pressure is produced. The same excitation of the medulla after division of the cord in the mid-dorsal region produces as great a pulmonary rise, but the systemic effect is now quite small.

Excitation of the upper dorsal roots, *i.e.* from the second to the seventh, produces rises of pulmonary pressure as marked as any of the preceding, but accompanied either by a small aortic rise or by no aortic effect. With the third nerve a marked rise of pulmonary pressure accompanied by a fall of aortic pressure is seen. Hence these nerves contain the vaso-constrictor fibres for the pulmonary vessels, since the effects produced on the pulmonary pressure must be due to constriction of the pulmonary arterioles, inasmuch as the simultaneous carotid effects are quite incompetent to cause them.

Finally, although it is undoubted from the results of the research that the mammalian pulmonary vessels receive vasomotor fibres, yet it is probable that this vasomotor mechanism is but poorly developed when compared to that regulating the systemic vessels.

Geological Society, February 20.—Dr. W. T. Blanford, F.R.S., President, in the chair.—The President announced that a special general meeting, for the consideration of the by-laws, would be called for Friday, March 15, at 4.30 p.m.—The following communications were read:—On the Cotteswold, Midford, and Yeovil Sands, and the division between Lias and Oolite, by S. S. Buckman. After giving a short sketch of the work and opinions of other writers, the author proceeded with the evidence on which his own views are based. He described a series of sections of the typical exposures of "sands" and contiguous strata, commencing near Stroud and terminating on the Dorset coast. Dividing the series into *seven* horizons, characterized by their distinctive Ammonites, viz. *Amm. communis, variabilis, striatulus, dispansus*, the genus *Dumortieria, Amm. Moorei*, and *opalinus*, and taking the *striatulus* beds as a fixed starting-point, the author demonstrated how the strata varied in regard to that horizon. The Cotteswold Sands, containing the *variabilis* and part of the *communis* horizons, were below the *striatulus* beds; the Midford Sands, containing the *dispansus* horizon, were above, *Gramm. striatulum* occupying a thin bed at the base; the Yeovil Sands, containing the *Moorei* and *Dumortieria* horizons, overlay a bed containing Ammonites of the *dispansus* horizon, and were consequently still later deposits. Since the different sands were deposited not on a horizontal plane, in point of time, but, as it were, obliquely, the deposit of Cotteswold Sands having ceased before that of Yeovil Sands commenced, it was incorrect to lump all the "sands" from the Cotteswolds to the Dorset coast under the single local name "Midford Sands," thereby implying a contemporaneity which did not exist, while the use of the present restricted local names was defended. The Ammonites were apparently uninfluenced by changes in the character of the deposit, since the same species are found in Limestone in the Cotteswolds, in Sands at Midford, and in argillaceous Marl at Ilminster. The change from argillaceous to arenaceous or calcareous deposits has been looked upon as so distinct a feature, that it has been utilized as a great argument in favour of drawing the line between Lias and Oolite at that point; but if this be done, the line is always drawn at different horizons in different districts. If lithology furnishes no reason for a dividing-line at this point, it was shown that neither did palæontology. It was also shown that the Ammonite family Hildoceratidæ dominated the period from the *falcifer* to the *concavus* zones, and that with the close of the latter zone they died out with singular abruptness, and that, furthermore, there exists, both in England and upon the Continent, a marked hiatus at the same point due to the absence of a zone or a number of zones. On account of these facts the proposal was put forward that d'Orbigny's term "Toarcien" should be employed to designate the strata fron the *falcifer* zone to the *concavus* zone inclusive, that this term should not be used in the sense of merely an extended "Upper Lias," but to mark an entirely distinct transition-formation—a definite part of the Jurassic period—separating the typical Lias from the mass of thoroughly Oolitic strata. The reading of the paper was followed by a discussion, in which the President, Mr. H. B. Woodward, Prof. Blake, Rev. H. H. Winwood, and Mr. Hudleston, took part.—On some nodular felstones of the Lleyn Peninsula, by Miss Catherine A. Raisin. Communicated by Prof. T. G. Bonney. Some remarks on the paper were made by Mr. Cole, Dr. Hicks, and Prof. Bonney.—On the action of pure water, and of water saturated with carbonic acid gas, on the minerals of the mica family, by Alexander Johnstone.

PARIS.

Academy of Sciences, March 4.—M. Des Cloizeaux, President, in the chair.—Remarks accompanying the presentation of a work entitled "Introduction à l'étude de la Chimie des anciens et du moyen age," by M. Berthelot. This work forms a sequel to the author's "Origines de l'Alchimie" and "Collection des anciens Alchimistes grecs," thus completing a series of historical researches which fully establish the true character of the old philosophic doctrines, methods, and practices, which were hitherto supposed to be mainly absurd and fanciful, but which must henceforth enter into the scheme of historical evolution of the positive sciences. Here M. Berthelot gives a full description and translation of the Leyden papyrus of Egyptian origin, the oldest extant treatise on chemistry. The signs, notations, and appliances of the ancient alchemists are also described and reproduced by the photogravure process.—On the artificial reproduction of halos and parhelic circles, by M. A. Cornu. The author obtains the halos more effectively than by Brewster's method, by depositing on a sheet of glass a crystalline powder of potash alum, which is obtained from a heated saturated solution shaken while cooling. The phenomenon is sufficiently bright to be projected and rendered visible to an audience. This remark applies also to the parhelic circles, which are obtained by an extremely simple process.—On the chondroid plaques in the tendons of birds, by M. L. Ranvier. By employing a solution of osmic acid, the author shows that the chondroid plaques in the tendons of the feet of finches and other small birds contain cellules filled with a fatty substance. By means of other reagents the presence is also revealed of glycogen and cartilage.—On the great storm of March 11, 12, and 13, 1888, in the United States, by M. H. Faye. Lieut. George Dyer's monograph on this terrific hurricane with its accompanying blizzard describes it as of an exceptional character, to which is inapplicable the law based on the circular theory—that is, the eight-point rule. Instead of the usual barometric pressure in form of a basin, it is stated to have presented the aspect of an immense linear depression, a trough of low barometer moving eastwards. This view is incompatible with the well known hypothesis advocated by M. Faye, who accordingly endeavours here to account for the recorded phenomena without having recourse to the "highly improbable theory of a vast trough of low temperature."—On the complete rectification of the sextant, by M. Gruey. Two methods are proposed, dealing with the rectification of the axis of rotation, R, of the large mirror M, with the rectification of the large and small mirrors M and M′, and with that of the axes U and S.—On the separation of zinc and cobalt, by M. H. Baubigny. In a previous paper (*Comptes rendus*, cviii. p. 236) the author described the process by which he has succeeded in completely separating zinc and nickel. The further experiments here carried out tend to show that, even in the state of sulphates, zinc and cobalt cannot be totally separated by sulphuretted hydrogen in presence of a small excess of free sulphuric acid unless the quantity of cobalt be relatively slight. The separation may also be effected with sufficient completeness if the quantity of zinc be slight.—Observations on saccharification by diastase, by M. L. Lindet. During saccharification the decomposition of the starch into maltose and dextrines is always accompanied by a secondary reaction in which the diastase attacks the dextrines and transforms them to maltose. This reaction is arrested by the presence of a certain quantity of maltose, which, however, may be removed by alcoholic fermentation, as maintained by Payen, although denied by O'Sullivan and others. Here M. Lindet confirms Payen's theory by another process, employing phenylhydrazine as a reagent for precipitating the maltose in the state of insoluble phenylmaltosazone.—On some new neutral and acid ethers of the camphols, by M. A. Haller. These ethers are formed under the same conditions as the succinates already described in the *Comptes rendus* of February 25.—Influence of mineral substances on the structure of plants, by M. Henri Jumelle. The experiments here carried out with lupins cultivated under like conditions, but some with distilled water, some with Knop's mineral solution, show that the presence of mineral substances is followed by a greater development of sap, and diminished formation of supporting elements; further, that the absence of salts considerably modifies the structure of plants, the modifications, however, being largely due less to the absence of the salts themselves than to the consequent diminution of water attracted and retained by the salts.—Papers were contributed by M. E. Goursat, on isogonal transformations in mechanics; by M. S. Arloing, on the general effects of the substances produced by *Bacillus heminecrobiophilus* under natural and artificial culture; by M. Stanislas Meunier, on the Carboniferous rocks containing *Bacillarites*, Stur; and by M. de Rouville, on the genus *Amphion* (*Pander*) in the Cabrières district, Hérault.

BERLIN.

Physiological Society, February 1.—Prof. du Bois Reymond, President, in the chair.—Prof. Moebius spoke on the movements of the flying-fish through the air. He first described, from personal observation, the way in which the fish shoot out of the water from both bows of the ship, and then propel themselves horizontally for a distance of several ship's-lengths with their pectoral and abdominal fins stretched out flat, skimming along without moving their fins, always in the direction of the wind, but either with or against the same. When they meet the crest of a wave they raise themselves slightly in the air, falling again to the same extent in the succeeding trough of the sea. Occasionally a slight buzzing of the fins may be observed, similar to that of the movements of the wings in many insects. At night they frequently fall on the deck of the ship. As the result of a detailed investigation, the speaker had proved that these fish do not fly, since the anatomical arrangements of their fins and muscles are not adapted to this purpose. What really occurs is that when frightened by the approach of a ship or any enemy they shoot up out of the water, as do so many other fish, and are then carried along by the wind, which strikes on the under surface of their outstretched and evenly-balanced fins. Notwithstanding the general acceptance which was accorded to the above investigation, it was urged by many that the buzzing of the fins, the rising over the crest of a wave, and the falling overboard after having landed on the deck of a ship, were evidences that this fish really executes movements which result in flight. In reply to this, the speaker pointed out that the buzzing of the fins takes place when a strong current of air is directed against the outspread fins of a dead flying-fish by means of a bellows, and further, that the rising over the crest of a wave or the bulwarks of a ship may be explained by the ascending currents of air which are always produced whenever a strong horizontal wind strikes against any elevated object such as a wave or part of a ship. Thus, finally, with the exception of the movements involved in its oblique sudden exit from the sea, all the motions of a flying-fish when in the air are really passive.—Dr. Posner spoke on the conversion of mucous membrane into cuticular tissue. It has long been known that ectodermal tissue can become converted into that which is characteristic of the alimentary tract; thus, for instance, when pieces of skin are transplanted into the cavity of the mouth, they become completely converted into mucous membrane, and the epidermis becomes an epithelium. On the other hand, no observations existed as to whether the reverse conversion of mucous into epidermal tissue is possible. No conclusive evidence could be drawn from the cuticular conversions which occur in mucous membranes which are derived from ingrowths of the ectoderm, and equally inconclusive were the cases of cuticular conversion which are observed in strictures of the urethra, and in the bladder, and in cases of papilloma and pachydermia of the mucous membrane of the mouth, larynx, and œsophagus. The speaker had found in Leidig a hint that in those animals which do not chew their food a conversion of the gastric mucous membrane occurs, which often amounts to a real cuticular formation. It is true that in birds the gizzard is possessed of tubular glands which pour out a secretion which at once sets into a mass as hard as bone, and provides a means of comminuting the food. But, on the other hand, cuticular growths are observed in the stomachs of Edentata, which consist of a true conversion of epithelium into epidermis. The speaker had been able to study this conversion in the stomach of Manis, and found by chemical and microscopical investigation that the whole stomach, even down to the region of the pylorus, is lined with a true epidermis, and that typical papillæ are developed underneath the same. The conversion of endodermal into ectodermal structures is hereby clearly proved, a fact which is not devoid of significance in pathology.

February 15.—Prof. du Bois Reymond, President, in the chair.—Prof. F. E. Schulze spoke on the organization and mode of living of Sponges. The simplest form of Sponge consists of a sac, which, being composed of three layers, is equivalent to the embryonic form of the more complicated types. This sac is attached by its base, and has at its apex an opening—the osculum; its wall is composed of an outer layer of epithelial cells (ectoderm), a middle layer of connective-tissue with migratory cells (mesoderm), and an inner layer of collared flagellated cells (endoderm), and is perforated with round and regularly distributed apertures. The more complex forms arise by a thickening and folding of the wall, the thickening being still more marked in the most complicated forms. In these, a system of branched canals takes the place of the simple apertures in the wall, communicating with the exterior by round openings, and leading internally into cavities lined with collared flagellated cells (choanocytes); from these cavities a further system of branched canals leads into the now limited internal cavity with its osculum. The skeleton of the Sponge is composed of chalk, siliceous earth, spongin, or foreign substances. In the simplest Sponges, consisting of a simple sac, the skeleton is made up of the simplest star-shaped spicules, with three rays, so as to give support to a membrane which is perforated with regularly alternating apertures; in the more complicated forms, these spicules possess four or six rays, as supplying the most convenient supporting structure, while a collar of simple rays is developed round the osculum. According to the material of which the skeleton is chiefly composed, Sponges may be classified as chalky, siliceous, horny, or sandy. The Hexactinellidæ, with six-rayed spicules, inhabit deep seas. In all Sponges, a continuous stream of water is observed entering the openings on the surface of the body, and emerging at the osculum, so that the Sponges filter the water in which they live. The movement of the water is brought about by the flagella; the contraction and retraction of the osculum is produced by elongated protoplasmic cells, but these cannot be regarded as muscle-cells until it has been proved to a certainty that they are connected with nerves, and receive their impulse from these nerves. Only one observer has as yet described a nervous system in Sponges, the majority not yet having seen it. Nothing has as yet been definitely ascertained as to the mode of nutrition of Sponges: from among the several hypotheses, some suppose that the solid organic particles which are suspended in the water are taken up by the ectoderm-cells and digested in the body; or else that these particles are taken up by the flagellated cells—that is to say, are passed from within outwards; or that the digestion is cellular, inasmuch as the amœboid migratory cells take up the food-particles, digest them, and pass on the digestive products to the rest of the body; or, finally, that Sponges, like plants, only absorb food-stuffs in solution. The reproduction of Sponges is both asexual and sexual, the first resulting from natural or artificial fission: natural fission, consisting of a simple separation, by constriction, of a portion of the body-substance, occurs in fresh-water Sponges. A further asexual mode of reproduction is by means of buds and gemmules. In the sexual mode of reproduction, the females develop eggs all over their surface, and the males spermatozoa, the latter consisting of a head and tail. The egg, after impregnation, goes through the various stages of segmentation met with in the higher animals, and then develops into a sac-like embryo.—Dr. Uhthoff gave an account of his researches on the dependence of visual acuteness in spectral colours upon the intensity and wave-length of the light; these have been recently reported to the Physical Society by Dr. Kœnig (NATURE, February 21, p. 408).

Physical Society, February 8.—Prof. Kundt, President, in the chair.—Dr. Michelson spoke on the normal rate of combustion of explosive mixtures of gases. When such a mixture is ignited at one point, and the temperature of combustion is propagated only by conduction from this point, then the surface at which combustion is taking place separates the burnt from the still unburnt portion of the mixture; the temperature of this unburnt portion is then raised by conduction to that at which it ignites, and it burns. Mallard and Le Chatelier have determined the rate at which this ignition is propagated, by observing the onward movement of the flame in a cylindrical vessel filled with the mixture of gases; Bunsen, on the other hand, allowed the explosive mixture to stream out of a burner with a known velocity, and took this as being equal to the rate of propagation of the combustion in the case where the flame was just on the point of striking back into the tube to which the burner was attached. An objection which may be urged against the first method is that the velocity with which the flame is propagated increases very rapidly the further it travels, so that it is uniform only at the beginning of the explosion. The objection to the second method is, that the flame is continually wavering in and out of the edge of the burner. Dr. Michelson made use, in his experiments, of the dark cone in the centre of the flame, in which the gases are still unburnt, and whose luminous envelope forms the limit of the commencing combustion. When the rate of supply of the combustible gases is uniform, this cone is very steady, and the rate at which the gases stream out from its surface is exactly equal to the rate of combustion of these gases. The volumes of the gases consumed were measured in accurate meters, and the size of the luminous envelope to the centre cone of the flame was determined from photographs of the flame. The mixtures examined were those of coal-gas and air, hydrogen and air, carbonic oxide and oxygen, hydrogen and oxygen, carbonic oxide and air, and of methane and air. With coal-gas and air the rate of combustion increased as the mixture contained more of the coal-gas, reaching a maximum with 18 per cent. of this gas, and then gradually became less; the maximum rate of propagation of the combustion was 70 centimetres per second. With hydrogen and air, the maximum rate was observed with 40 per cent. of hydrogen in the mixture, being then 270 centimetres per second, and then becoming less. The curve representing the rate of combustion of carbonic oxide and oxygen presented a very different appearance. The maximum rate was only obtained with 75 per cent. of the carbonic oxide, and was about equal to the maximum for coal-gas. For the other three mixtures, no curves could be drawn. With a mixture of hydrogen and oxygen, the speaker estimated the maximum rate of combustion as being about 10 metres per second, but no actual measurement was possible, since the mixture could not be expelled at this rate from the burner, which consisted of a glass tube 1 metre long.—Prof. Preyer spoke on combination-tones. He endeavoured to prove that difference- and summation-tones have no objective existence. The first of these are the outcome of a co-vibration in the inner ear. When two different tuning-forks are made to vibrate for a long time, and are then damped, and a third tuning-fork, whose vibration-frequency is only slightly greater than that of the difference in frequency of the other two, is applied to the head, the experimenter hears the corresponding beats. Persons with a defective tympanic membrane in one ear, and a normal membrane in the other, were unable to appreciate difference-tones with the former which they could perfectly well do with the latter. According to the speaker, the summation-tones are really difference-tones, due to the fundamental tone and over-tones of the vibrating forks.—Prof. H. W. Vogel exhibited a complete spectrum of cyanogen, which he had obtained by photographing the spectrum of an arc-light produced by a concave grating; the spectrum extended in the red beyond the line A. Most remarkable was the abundance of lines which were fixed on the photograph, and made visible. The speaker discussed briefly the respective advantages of a concave grating for laboratory experiments on spectra, and of the ordinary prism for practical purposes, especially for observations during solar eclipses.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Scottish Moors and Indian Jungles: Captain J. T. Newall (Hurst and Blackett).—The Scientific Works of C. William Siemens, 3 vols.: edited by E. F. Bamber (Murray).—The Collected Mathematical Papers of Arthur Cayley, vol. i. (Cambridge Press).—A Catalogue of the Newton Manuscripts, Portsmouth Collection (Cambridge Press).—The Gamekeeper's Manual: A. Porter (Douglas).—Catalogue of the Fossil Cephalopoda in the British Museum (Natural History), part 1: A. H. Foord (London).—Catalogue of the Chelonians, Rhynchocephalians, and Crocodiles, in the British Museum (Natural History), new edition: G. A. Boulenger (London).—A Hand-book of Cryptogamic Botany: A. W. Bennett and G. Murray (Longmans).—Blackie's Modern Cyclopedia, vol. i.: edited by C. Annandale (Blackie).—A Treatise on Chemistry, vol. ii., part 2, new edition: Sir H. E. Roscoe and C. Schorlemmer (Macmillan)—Henri Sainte-Claire Deville; sa Vie et des Travaux: J. Gay (Paris, Gauthier-Villars).—The House that Jack Built in Diversified Consideration: F. J. Wilson (Reeves).—Encyklopædie der Naturwissenschaften Erste Abthg., 59 Liefg.; Zweite Abthg., 51 and 52 Liefg. (Breslau, Trewendt).—Our Earth and its Story: edited by P. Brown (Cassell).—Revision of North American Umbelliferæ: J. M. Coulter and J. N. Rose.—Notes from the Leyden Museum, vol. x. Nos. 1–4, vol. xi. No. 1 (Leyden).—Folk-Lore Journal, vol. vii. part 1 (E. Stock).

CONTENTS.

PAGE
Through the Heart of Asia 457
The Testing of Materials of Construction 459
Our Book Shelf:—
Packard: "Entomology for Beginners" 459
Bateman: "The First Ascent of the Kasai: being some Records of Service under the Lone Star" . . 460
Ramsay: "Tabular List of all the Australian Birds" 460
Letters to the Editor:—
The Meteoric Theory of Nebulæ, &c.—**Prof. G. H. Darwin, F.R.S.** 460
The Formation of Ledges on Hill-sides. (*Illustrated.*) **Edmund J. Mills** 460
Weight, Mass, and Force.—**Prof. A. G. Greenhill, F.R.S.** 461
The Inheritance of Acquired Characters.—**Prof. Marcus M. Hartog** 461
A Fine Meteor.—**B. Woodd Smith** 462
Bishop's Ring.—**T. W. Backhouse** 462
The Philosophical Transactions.—S. 462
On the Composition of Water. By **Lord Rayleigh, Sec. R.S.** 462
Examinations in Elementary Geometry 464
Electrostatic Measurement. By **Sir William Thomson, F.R.S.** 465
Notes 466
Our Astronomical Column:—
Distribution of Sun-spots in Latitude 469
Astronomical Phenomena for the Week 1889 March 17–23 469
Geographical Notes 470
The Discharge of a Leyden Jar. (*Illustrated.*) By **Prof. Oliver J. Lodge, F.R.S.** 471
On the Limit of the Solar Spectrum, the Blue of the Sky, and the Fluorescence of Ozone. By **Prof. W. N. Hartley, F.R.S.** 474
University and Educational Intelligence 477
Scientific Serials 477
Societies and Academies 478
Books, Pamphlets, and Serials Received 480